

damaged. It was in this section that all the injuries occurred.

Farther on the city pumping station was considerably damaged, and beyond that practically nothing hurt as the course was then over unimproved property.

One or more persons who witnessed the storm reported that they saw a funnel-shaped cloud attending the vortex.

The extent and character of the wreckage leaves no doubt of the tornadic character of the storm, but the path was so narrow that the wreckage left showed only occasional evidence of the whirling motion of the air. Much of the damage indicated that the vortex was barely touching the earth, and that roofs were lifted or houses picked up and carried along in the direction of the storm movement and left scattered in confusion.

At the city office of the Weather Bureau about 2 or 3 miles southwest of where the storm struck, no special observation of the clouds was made near that time, but a thunderstorm attended by heavy rainfall and very thick dark clouds was in progress, the rain having begun at 7:50 a.m., or 15 minutes before the tornado occurred. The winds were not strong, the extreme gust being only about 22 miles per hour, but a well-defined shift from southeast to southwest and west occurred during the progress of the thunderstorm. Mr. C. E. Mahaffey, in charge of the Airport Station at Menefee Airport, about 3 to 4 miles east of the storm path, observed the thunderstorm cloud over the city at the time of his 8 a.m. observation, and describes it as being black in color and presenting the appearance of a squall-line front, but with a decided greenish cast underneath the black roll of the advancing squall. He did not observe the vortex cloud, but stated that it might have been obscured by falling rain. He stated that he turned on the wind velocity indicator and it registered a velocity of 60 miles per hour from the southeast at 8:05 a.m. as the storm approached from the west and southwest. The tornado was in progress at this time approximately 4 miles northwest of his station. This will indicate the violence of the rush of air inward and upward toward the vortex, which is

much stronger than the usual uprush in front of a thunder-squall in this section.

The barometers at the city office and airport station were but little affected. At the city office a very slight dip of probably 0.02 inch was noted on the barograph trace, followed by the usual rise characteristic of thunderstorms.

Other storms which have caused damage in appreciable amounts in New Orleans during the past 35 years were:

October 5, 1906.—A well-defined tornado of small size occurred in which 3 persons were killed and 21 injured. Damage, \$300,000.

October 23, 1913.—Severe thunderstorm; a few persons injured. Damage, \$10,000.

April 7, 1916.—Probably a tornado. Fifteen buildings damaged. Two persons killed and four others injured. (In Gentilly section.) No money estimate of damage.

May 2, 1923.—Severe thunderstorm. Several injured; many houses damaged, but no money estimate of damage. (Milenburg, West End, and Lake Shore.)

May 19, 1923.—Incipient tornado. No one injured. Damage \$25,000, principally in vicinity of Jahnecke Dry Docks, where buildings were damaged.

July 24, 1924.—Doubtful, probably small tornado. River boat *Climax* was capsized; steel sheds at Jackson Avenue and River were stripped of corrugated iron sides. Damage \$29,225; no deaths or injuries.

April 17, 1924.—Windsquall of almost tornadic force above Carrollton Avenue and between Oleander Street and Metairie Cemetery and in Jefferson Parish. Damage, \$100,000. Fifty persons injured. Numerous houses moved from their foundations and several wrecked. Terrific hailstorm, with stones 2 to 3 inches in diameter; 3 inches deep on ground in places.

February 22, 1926.—Severe local storm, uncertain as to tornado, occurred in vicinity of Salcedo and Bienville Streets. Several persons injured; damage, \$13,000.

May 16, 1930.—Severe local storm, near Royal and Piety Streets. Warehouse and other small houses damaged. No injuries.

RIME CAPS AND SNOW COCKS

Mr. R. L. Frost, Senior Observer, Weather Bureau office at Fairbanks, Alaska, has kindly sent to the Central Office a number of winter pictures. A few of these are here reproduced because of their general interest.

Figure 1*a* is the top of a ventilator pipe that had become capped with rime—granular ice incident to the solidification on contact of undercooled water droplets. The droplets in this case resulted from the chilling of the exit air to far below its dew point on mixing with the excessively cold (-50° F., or more) outer air.

Figures 1*b* and 1*c* are two views of a chimney top similarly capped with rime, as occurs at this low tem-

perature whatever the fuel used for heating. The fuel itself, if wood, as in the present case, oil or gas, adds a considerable amount of moisture to the chimney air which must increase the rate of growth of the cap. However, as the chimney also is a ventilator it caps, as stated, at excessively low temperatures, whether water is a product of the combustion of the fuel or not.

Figures 2*a*, 2*b*, and 2*c* are several views of snow cocks formed, each, of dry snow piled by shifting winds around a small isolated tree. Similar sand cocks, of like origin though seldom so beautifully symmetrical, often are seen in arid regions.—*Editor*.

SLEET AND ICE STORM IN TENNESSEE ON MARCH 19, 1934

By R. M. WILLIAMSON

[Weather Bureau office, Nashville, Tenn., Apr. 6, 1934]

A sleet and ice storm of unusual intensity occurred over central Tennessee on Monday, March 19, 1934. This was a feature of a rather strong cyclone centered about Atlanta, Ga., at 8 a.m. (eastern standard time) of the 19th, which moved east-northeastward and caused general precipitation along the wind-shift line and for some distance westward. An all-night sprinkle turned to rain and sleet at Nashville, Tenn., at 5 a.m. of the

19th. This combination continued until 3:30 p.m., and the rain until 6:30 p.m. The total amount of precipitation on the 19th was 1.27 inches. The temperature ranged from 31° at 2 a.m. to 27° at 2 p.m. and 32° at 8 p.m. (eastern standard time). The prevailing wind was north to 10 a.m. and northwest thereafter. The maximum wind velocity was 18 miles per hour from the northwest at 3:03 p.m.

A small amount of glaze had formed by 7 a.m. and increased in thickness as long as the rain fell. In the late afternoon the coating of sleet and ice on the ground was 1 inch thick, and the glaze on trees, shrubbery, wires, etc., $\frac{1}{2}$ to $\frac{3}{4}$ of an inch thick, except on the under side of wires and branches, where it was about $\frac{1}{4}$ of an inch. Icicles by the millions were suspended close together from wires, fences, bridge railings, eaves of buildings, and other horizontal objects. These were from 2 to 4 inches long on wires and as much as 10 or 12 inches on other objects, and contributed enormously to the total weight of the ice and the consequent damage. The northern walls of buildings were plastered at least half an inch thick with the ice, and in some cases as much as two thirds of an inch. Shrubby, weeds, and grass were incased. The station anemometer showed less speed under the weight of the ice coating, and when this was removed at 2:45 p.m. the velocity showed an appreciable increase. Each cup of the anemometer had suspended horizontally from it an icicle 3 inches or more in length.

The scene presented by the ice was one of rare beauty, even during its formation when the sky was overcast and the rain and sleet falling, but early the following day, under a cloudless sky and in bright sunshine, the earth was indeed a fairyland of brilliance. Similar scenes and

conditions were noted throughout the central counties of the State, the storm being particularly heavy in the area known as the Central Basin and in the upper Cumberland Valley. However, very little ice remained at sunset of the next day.

The damage was enormous, particularly to trees and telephone, telegraph, and light wires and poles. Trees as much as 18 inches in diameter were split and some were uprooted, while others were broken off near the ground. Thousands of trees had large limbs broken, many falling upon light and power lines and disrupting the services. The damage was severe to evergreen trees, including magnolia, cedar, and pine. Fruit trees suffered considerably. Fortunately, the wind diminished as the ice attained its greatest thickness and remained light throughout the night and the following day.

The Southern Bell Telephone & Telegraph Co. estimates its loss in Tennessee roughly at \$250,000. They report some 4,100 poles down, many of them small. The Tennessee Electric Power Co. also suffered severe losses, as did the telegraph companies and the local telephone companies. It is believed that the total losses from the ice storm, exclusive of trees, will approximate \$350,000, and the removal of broken trees and other debris from the streets and highways was a big task.

BIBLIOGRAPHY

C. FITZHUGH TALMAN, *in charge of Library*

RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

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SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING MARCH, 1934

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1932 REVIEW, page 26.

Table 1 shows that solar radiation values were close to normal at all three Weather Bureau stations.

Table 2 shows a deficiency in the total solar radiation received on a horizontal surface at Washington, Madison,

Pittsburgh, Fairbanks, and Miami, and an excess at all other stations.

Polarization observations obtained at Washington on 5 days give a mean of 61 percent with a maximum of 65 percent on the 15th. Both of these values are close to the March normals. At Madison observations were taken on the 27th only and the value then obtained, 60 percent, is below the mean for March.